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**UNITED STATES DISTRICT COURT  
 FOR THE NORTHERN DISTRICT OF CALIFORNIA**

PACIFIC COAST FEDERATION OF FISHERMEN'S )  
 ASSOCIATIONS; INSTITUTE FOR FISHERIES )  
 RESOURCES; GOLDEN STATE SALMON )  
 ASSOCIATION; NATURAL RESOURCES DEFENSE )  
 COUNCIL, INC.; DEFENDERS OF WILDLIFE; and )  
 BAY.ORG d/b/a THE BAY INSTITUTE, )

Plaintiffs, )

v. )

WILBUR ROSS, in his official capacity as Secretary of )  
 Commerce; CHRIS OLIVER, in his official capacity as )  
 Assistant Administrator for Fisheries at the National )  
 Oceanic and Atmospheric Administration; NATIONAL )  
 MARINE FISHERIES SERVICE; DAVID )  
 BERNHARDT, in his official capacity as Secretary of the )  
 Interior; AURELIA SKIPWITH, in her official capacity )  
 as Director, U.S. Fish and Wildlife Service; U.S. FISH )  
 AND WILDLIFE SERVICE; BRENDA BURMAN, in )  
 her official capacity as Commissioner of Reclamation; and )  
 U.S. BUREAU OF RECLAMATION, )

Defendants. )

**DECLARATION OF  
 PETER B. MOYLE  
 IN SUPPORT OF  
 PLAINTIFFS' MOTION  
 FOR PRELIMINARY  
 INJUNCTION**

1 I, Peter Moyle, Ph.D., declare as follows:

2 1. The facts set forth in this declaration are based upon my personal knowledge and if called  
3 as a witness in this proceeding, I could and would testify competently thereto under oath. As to  
4 those matters that reflect an opinion, they reflect my personal opinion on the matter.

5 2. I am a University of California ("UC") Davis Distinguished Professor Emeritus in the  
6 Department of Wildlife, Fish, and Conservation Biology, and associate director of the UC Davis  
7 Center for Watershed Sciences. I have been a member of the Natural Resources Defense  
8 Council ("NRDC") for over 20 years. I support NRDC because it does important work  
9 advocating for and protecting the natural environment of the San Francisco Bay-Delta and the  
10 fishes that depend on it, and I believe it is important to protect that environment for native  
11 aquatic life in general.

12 3. I have studied the ecology and conservation of freshwater and estuarine fishes in  
13 California for over 50 years. I began my career researching those topics in 1969, as an assistant  
14 professor at California State University, Fresno, and have continued that research ever since. I  
15 joined the faculty at UC Davis in 1972, and currently conduct research as Distinguished  
16 Professor, Emeritus, and Associate Director of the Center for Watershed Science.

17 4. In general, my research interests include the conservation of aquatic species, habitats, and  
18 ecosystems; the ecology of fishes of the San Francisco Estuary; the ecology of California stream  
19 fishes; and the impacts of introduced aquatic organisms on native ecosystems and organisms.  
20 My research team has documented the status of the native freshwater and estuarine fish species  
21 in California. I am particularly interested in researching the San Francisco Estuary because it is  
22 a novel and unique ecosystem. Not only is it the largest estuary on the West Coast, but it has  
23 very complex hydrodynamics and a mix of species unparalleled in other estuaries. As a result, a  
24 major focus of my research has been native and non-native fishes of the San Francisco Estuary; I  
25 also have a special interest in delta smelt, as well as salmon, steelhead, and other migratory  
26 fishes.

27 5. I have authored or co-authored over 275 peer-reviewed publications or books on  
28 California fishes, including *Inland Fishes of California*, (UC Press 2002), which explains the

1 characteristics, taxonomy, life history, ecology, and current status and distribution of all native  
2 and introduced fish species in the inland waters of California, along with suggestions for  
3 conserving native fishes in light of the state's growing economy and population. I have also  
4 authored or contributed to various scientific reports discussing the status of and effects of water  
5 quality and quantity on fish species such as winter-run and fall-run Chinook salmon, Central  
6 Valley steelhead, Delta smelt, and Longfin smelt. For instance, I am the lead author of *Fish*  
7 *Species of Special Concern in California* (California Department of Fish and Wildlife 2015),  
8 which provides scientists and the public with the most recent information on California's  
9 sensitive native freshwater and anadromous fishes. I also co-authored the peer-reviewed paper  
10 *Rapid Decline of California's Native Inland Fishes: A Status Assessment* (2011, Biological  
11 Conservation 144: 2414-2422), which used a quantitative protocol to determine the conservation  
12 status of all approximately 120 freshwater native California fishes. In addition to my academic  
13 publications, I also contribute regularly to the California WaterBlog, a blog about California  
14 wildlife and water policy, available at <https://californiawaterblog.com/tag/peter-moyle/>.

15 6. Over the years, I have studied aquatic habitats and species throughout the San Francisco  
16 Estuary and its watersheds. For example, as part of my research into the ecology and  
17 conservation of Bay-Delta fishes, I conducted monthly sampling of fishes and  
18 macroinvertebrates in Suisun Marsh 1979-2015, which is one of the most important tidal habitats  
19 in the estuary. This project is still on-going, with other scientists in charge, although I still advise  
20 the project and at times help with the sampling. Sampling by trawl or seine currently takes places  
21 at 21 locations throughout the Marsh. The resulting 40-year (and counting) data set allows study  
22 of the long-term trends of native and alien fishes such as delta smelt, Sacramento splittail, and  
23 striped bass and is the basis for life history studies of those fishes. I am still using the data  
24 collected by this project to conduct analyses of status and trends of the fishes. In addition to  
25 conducting sampling in Suisun Marsh for my research, I also took undergraduate and graduate  
26 students out on the water and train them how to properly catch, identify, measure, and release  
27 fish. This tradition continues. Many of these students wind up working for state and federal  
28 agencies, often on fishes of the estuary. Helping to train the next generation of managers is a

1 source of great pride for me. UC Davis is currently funded to conduct this monthly sampling in  
2 Suisun Marsh for the foreseeable future.

3 7. In addition, for seven years, this sampling program has been extended about 80 miles  
4 upstream into the North Delta, to Cache and Lindsey Sloughs along the Sacramento River. Those  
5 sloughs are some of the most "natural" remaining areas of the Delta, and therefore one of the  
6 best candidates for habitat restoration, in part because of the natural drainage patterns that still  
7 exist on the landscape and its connections with the Sacramento River. The purpose of sampling  
8 those areas is to study the characteristics of tidal habitats that favor native versus alien fishes,  
9 with the aim of using the results to inform habitat restoration projects in the future.

10 8. Over the years, I have also visited and sampled locations such as South San Francisco  
11 Bay, the Napa River estuary, and the tidal reaches of the Cosumnes River in the Delta. I greatly  
12 enjoy and look forward to the time I get to spend doing field work. I take pleasure in observing  
13 the Bay-Delta ecosystems that I study and interacting with and encountering firsthand the diverse  
14 aquatic species that I study. I view the opportunity to continue to do so as one of the continuing  
15 delights and to write about my observations past and present is one the delights of my  
16 professional career. My aesthetic and professional experiences in and enjoyment of these  
17 ecosystems, however, are diminished and harmed by the decline of native fish populations such  
18 as native smelt and salmonids. The entire ecosystem is severely altered by the greatly  
19 diminished levels or even absence of species such as Delta smelt from their historic habitat.

20 9. Although my research program covers many species in the Bay-Delta and its watersheds,  
21 for many years have had a special focus on Delta smelt. For example, I recently co-authored the  
22 article *Delta Smelt: Life history and Decline of a Once-Abundant Species in the San Francisco*  
23 *Estuary* in *San Francisco Estuary and Watershed Science* (July 2016), available at  
24 <http://escholarship.org/uc/item/09k9f76s> as well as *Delta smelt and the politics of water in*  
25 *California* (2018, Fisheries 43:42-51). Since I began researching the species in the 1970s, I have  
26 seen its population decline drastically, due to damaged habitat and the species' sensitivity to  
27 changing water quality and quantity. The decline has reached the point where field research on  
28 the species is no longer practical or feasible. The necessary research permits are too difficult to

1 obtain, and too stringent. For instance, our current permit only allows for two smelt to be taken  
2 each year in Suisun Marsh. In the event our sampling exceeds that limit, the sampling program  
3 could be shut down. The drastic decline and continued low abundance of Delta smelt therefore  
4 directly harms my research interests, including my ability to study and sample Delta smelt, and  
5 reduces my enjoyment of my field research. Relatedly, the extreme low abundance of Delta  
6 smelt limits my ability to teach others about Delta smelt sampling and field research, thereby  
7 negatively impacting my interests in and enjoyment of teaching to diverse groups.

8 10. My research program also encompasses anadromous species such as spring-run and  
9 winter-run Chinook salmon and Central Valley steelhead from the Sacramento River and San  
10 Joaquin River watersheds. For instance, I co-authored *Impending extinction of salmon,*  
11 *steelhead, and trout (Salmonidae) in California*, Environmental Biology of Fishes, DOI  
12 10.1007/s10641-012-9974-8 (2012), which describes the current imperiled status of anadromous  
13 species. Working with a team of researchers from Davis and California Trout, I am the lead  
14 author of the 2017 report, *State of California Salmonids II: Status, Threats, and Solutions for*  
15 *California's Salmon, Steelhead, and Trout*, available at <https://caltrout.org/sos>. In addition to  
16 assessing the current distribution, status, and life histories of anadromous fish, my work includes  
17 research into how to restore migration, spawning, and rearing habitat in the Delta and its  
18 tributaries to rehabilitate anadromous and resident fish populations. For example, I co-authored  
19 the report *Recommendations on Restoring Spring-Run Chinook salmon to the Upper San Joaquin*  
20 *River* (2007) as part of the San Joaquin River Restoration Program to rehabilitate salmon runs in  
21 the San Joaquin Basin. I also coauthored the peer-reviewed article *Water Management*  
22 *Adaptations to Prevent Loss of Spring-Run Chinook Salmon in California Under Climate*  
23 *Change* (Journal of Water Resources Planning and Management 138:465-478, 2012), which  
24 examined stream flow and water temperature regimes that lead to long-term reductions in spring-  
25 run Chinook salmon. My aesthetic and professional experiences and the enjoyment I derive  
26 from native Chinook salmon and steelhead, however, are diminished and harmed by the decline  
27 of these native fish populations.

28

1 11. My most recent research projects are focused on the common theme of reconciliation  
2 ecology, which studies ways to encourage biodiversity in human-influenced ecosystems such as  
3 the Bay-Delta. My research group is particularly focused on developing an understanding as to  
4 how the native fishes of California and the ecosystems on which they depend can persist into the  
5 future, given the growing impacts of human use of the planet and climate change. In addition to  
6 continuing the Suisun Marsh and North Delta ecology field studies, my research includes  
7 conducting interdisciplinary studies on California water policy, the environmental flow  
8 requirements of fishes, the effects of dams, and the conservation and management of flood plains  
9 important to salmon and other fishes in the Central Valley. Of particular interest is the Yolo  
10 Bypass, a floodplain system that is partially in the Delta.

11 12. I believe that conservation of native species is important because over 80% of  
12 California's 125+ extant native fishes are found only or mainly in this state. Without these  
13 uniquely Californian species, our streams and lakes would have the same homogenized fauna  
14 found in much of North America, made up of carp, bass, catfish, sunfish and other common  
15 fishes. The existence of salmon and steelhead are especially important to my use and enjoyment  
16 of the Delta and the Sacramento River. And as a researcher and nature lover, it is extremely  
17 important to me that salmon and steelhead return to the Central Valley every year. The  
18 opportunity to see these fishes in their natural habitat inspires me. Without these fishes, my  
19 experience of the rivers and Delta will be made less enjoyable because I know that an essential  
20 part of the overall health of the ecosystem is diminished or missing entirely.

21 13. In addition to studying the species themselves, another important focus of my research  
22 has been habitat restoration, investigating how to create habitats that favor native fishes. For  
23 example, I co-authored the article *Where The Wild Things Aren't: Making The Delta a Better*  
24 *Place For Native Species*, San Francisco: Public Policy Institute of California (2012), which  
25 makes recommendations how to approach the management of the Delta's water and land to  
26 create habitat conditions for native species in the context of continuing land and water use by  
27 humans. I also co-authored the article Kiernan, J.D., P. B. Moyle, and P. K. Crain. 2012.  
28 *Restoring Native Fish Assemblages to a Regulated California Stream Using the Natural Flow*

1 *Regime Concept* (Ecological Applications. 22:1472-1482, 2012), which explores how to achieve  
 2 the restoration of native fishes by manipulating stream flows at biologically important times of  
 3 the year. In addition to my academic contributions, I also write blog posts setting forth strategies  
 4 for saving the species that depend on the Delta, including *Why and How to Save Native Salmon*  
 5 *During Severe Drought*, California Water Blog (2014),<sup>1</sup> *The North Delta Habitat Arc: An*  
 6 *Ecosystem Strategy for Saving Fish*, California Water Blog (2016),<sup>2</sup> and *Futures for Delta Smelt*,  
 7 California Water Blog (2019).<sup>3</sup>

8 14. I have also served on numerous advisory bodies, with the goal of providing scientific  
 9 analysis and advice to address the problems of preserving native Delta ecosystems and Delta-  
 10 dependent wildlife. For instance, I was the head of California's Delta Native Fishes Recovery  
 11 Team from 1993-1995, and a member of the San Joaquin River Restoration Technical Advisory  
 12 Committee from 2007-2011.

13 15. Because adequate freshwater flows are important to sustaining native species and their  
 14 habitat in the Delta, I have also been involved in interdisciplinary studies regarding California  
 15 water policy, particularly with respect to environmental flow requirements. For example, I am  
 16 one of eight coauthors of the 2011 book *Managing California's Water. From Conflict to*  
 17 *Reconciliation*. (PPIC, San Francisco. 482 pp.). Also, in 2011, I completed a project for the  
 18 California Energy Commission on how well current environmental flow practices are working  
 19 and suggested improvements to those practices. Recently, I co-authored a study entitled  
 20 *Developing Biological Goals for the Bay-Delta Plan: Concepts and Ideas from an Independent*  
 21 *Scientific Advisory Panel*, (Delta Stewardship Council, Delta Advisory Program April 2019).

22 16. In addition to my estuary-specific research and activities, I have a strong interest in the  
 23 conservation of watersheds and river basins throughout the west and have devoted my time and  
 24 expertise to that cause for many years. For instance, I have been a board member of The Natural

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 26 <sup>1</sup> Available at <https://californiawaterblog.com/2014/02/17/why-and-how-to-save-native-salmon-during-a-severe-drought/>

27 <sup>2</sup> Available at <https://californiawaterblog.com/201611/06/the-north-delta-habitat-arc-an-ecosystem-strategy-for-saving-fish/>

28 <sup>3</sup> Available at <https://californiawaterblog.com/2019/12/15/futures-for-delta-smelt/>

1 Heritage Institute, a non-profit organization dedicated to the mission of restoring and preserving  
2 natural functions in major river basins to maintain their water-dependent ecosystems, since 1980.  
3 I am also a board member of Western Rivers Conservancy, which protects outstanding river  
4 ecosystems in the western United States, including the Scott and Klamath River Basins in  
5 California. In 2010, I co-authored a book on conservation science, *Protecting Life on Earth* (UC  
6 Press).

7 17. It is important to me that the government fulfills its duty to protect the species and water  
8 quality in the San Francisco Estuary and rivers that flow into it. I have dedicated my career to  
9 studying the estuary's fishes, including Delta smelt and Chinook salmon, and intend to continue  
10 visiting the estuary and studying these fish as long as possible. My research program depends on  
11 the survival of those and other Bay-Delta fish species and on my ability to conduct scientific  
12 research on them. Changing water quality, diminishing and altering flows, and increasing harm  
13 done to fish species effects what species we are able to study, and hinders research into  
14 California native species and ecosystems.

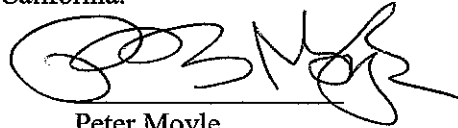
15 18. Of course, if species that are currently on the brink of extinction, such as Delta smelt and  
16 Chinook salmon, actually go extinct due to a combination of factors, including from the effects  
17 of the operation of the Central Valley Project and State Water Project, scientific inquiry  
18 regarding those fishes will be foreclosed forever. We know surprisingly little about many of  
19 California's native fishes, and full accounts of some of those fishes may not be complete before  
20 they become extinct. That gap in our scientific knowledge can never be rectified.

21 19. Finally, I have spent over 45 years of my life experiencing and interacting with the Delta,  
22 Suisun Marsh and the Bay, their river tributaries, and the various aquatic species that rely on  
23 them. I take great pleasure in my visits to the estuary and its watersheds, plan to continue those  
24 visits in the future, and have an abiding aesthetic interest in and connection with those  
25 ecosystems and the species in them. Native fish species such as Chinook salmon, Central Valley  
26 steelhead, and Delta smelt are both aesthetically and biologically important to me and these  
27 ecosystems, and I believe it is vitally important to protect those native species and to manage  
28 ecosystems for future generations to study and enjoy as I do. Those interests are harmed when

1 the government harms or fails to adequately protect listed fish species and their habitats. The  
2 continuing harm to and low abundance of these species harms me both personally and  
3 professionally, and further declines in the viability of Delta Smelt, Central Valley steelhead, and  
4 Chinook salmon would magnify these harms.

5  
6 I declare under penalty of perjury under the laws of the United States and the State of  
7 California, that to the best of my knowledge the foregoing is true and correct.

8  
9 Executed this day of March 2, 2020 in Davis, California.

10  
11   
12 Peter Moyle